

INITIAL LETTER
(General - Patent Pending)

Docket No.
89158.059902(81326/LPK)

In Re Application Of: Chen et al.

Serial No.
09/608,818

Filing Date
June 30, 2000

Examiner
E. Tsoy

Group Art Unit
1762

Title: **METHOD OF CURING A FUSER MEMBER OVERCOAT AT LOW TEMPERATURES**

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Dated: April 29, 2003

Lee J. Fleckenstein
Reg. No. 36,136
JAECKLE FLEISCHMANN & MUGEL, LLP
39 State Street
Rochester, New York 14614-1310
Tel: (585) 262-3640
Fax: (585) 262-4133

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Applicant(s): Chen et al.

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09/608,818

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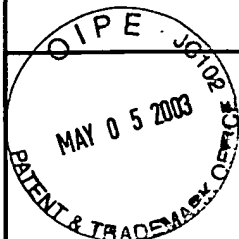
Examiner

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1762

Invention: METHOD OF CURING A FUSER MEMBER OVERCOAT AT LOW TEMPERATURES

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Examiner

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Invention: METHOD OF CURING A FUSER MEMBER OVERCOAT AT LOW TEMPERATURES

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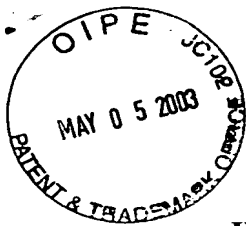
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PATENT
81326LPK
89158.059902

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Jiann H. Chen et al.
Serial No.: 09/608,818
Filed: June 30, 2000
For: METHOD OF CURING A FUSER MEMBER
OVERCOAT AT LOW TEMPERATURES

Examiner:
E. Tsoy

Art Unit:
1762

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REPLY BRIEF UNDER 37 CFR §1.193

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Washington, D.C. 20231
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This is in response to the Examiner's Answer mailed March 18, 2003, which acknowledges the correctness in the Appeal Brief of the status of claims, status of amendments after final rejection, summary of the invention, issues, and the appealed claims included in the Appendix.

Remarks

In the section (9), *Prior Art of Record*, of the Examiner's Answer, only the four references cited in the rejections of claims 1-22 are listed. Not included are Eddy et al., U.S. Patent No. 5,017,432 ("Eddy"), cited by the Examiner in the March 5, 2002 Office Action; Effenberger et al., U.S. Patent No. 5,194,335 ("Effenberger"), cited by the Examiner in the July 17, 2002 Office Action, and Shifman et al., U.S. Patent No. 6,203,873 ("Shifman"), cited by the Examiner in the September 19, 2002 Advisory Action.

Also not referred to in section (9) are the non-patent references included as Attachments A, B, C, and D to the appellants' Appeal Brief. In their Appeal Brief, the appellants extensively discussed all of the teachings of the art of record, but, apart from a brief reference to Attachment B on page 15 of the Examiner's Answer, the Examiner failed even to mention the prior art of record that was omitted in section (9).

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Throughout the prosecution of this application, the Examiner has insisted, despite overwhelming evidence to the contrary in patents, technical treatises, and manufacturers' publications, that fluorocarbon thermoplastic copolymers such as the more recently commercially available THV fluoroplastics, which are employed in the fuser member release layers of the present invention and of the prior art Blong, are not patentably distinct from fluorocarbon elastomers such as the older commercially available Viton® fluoroelastomers, which are employed in the compositions disclosed in Hartley, Lentz, Schlueter, and Eddy.

Fluorocarbon elastomers and fluorocarbon thermoplastics are well recognized as distinctly different materials characterized by substantially different physical properties such as, for example, glass transition temperatures, which are applicable to fluoroelastomers, and melting ranges, which are applicable to fluoroplastics.

Fluoroelastomers exhibit elastomeric, i.e., flexible or rubbery properties when cross-linked. (cf. Attachment A) Because of these properties, Viton® fluoroelastomers find wide use in the fabrication of molded goods such as o-rings, v-rings, and gaskets. (cf. Attachment B), where high resilience to ensure tight sealing is essential. Contrary to the assertion on page 15 of the Examiner's Answer, the fact that Viton® B, which is a fluoroelastomer terpolymer formed from vinylidene fluoride (VF2), hexafluoropropylene (HFP) and tetrafluoroethylene (TFE), can be molded, extruded, or calendared does not qualify it as a thermoplastic polymer.

THV Fluoroplastics such as THV-400 and THV-500 have melting points in the range of 150-250°C and are typically processed by melt extrusion at temperatures of about 230-250°C. (cf. Attachments C and D) It should be noted that THV fluorothermoplastics, despite their very different physical properties, comprise the same three monomers as the fluoroelastomer Viton® B: tetrafluoroethylene (TFE), hexafluoropropylene (HFP), and vinylidene fluoride (VF2, also referred to as VDF)

The teachings in Attachments A-D to the Appeal Brief clearly point out the differences in the properties of fluoroplastics and fluoroelastomers that serve to distinguish these materials from one another. Even though the monomeric compositions of both of these commercial products may fall within the ranges recited in instant claim 1, it is well understood by those skilled in the art, including their commercial producers and suppliers, that fluoroelastomers and fluorothermoplastics are distinctly different materials.

This recognition of fluoroelastomers and fluorothermoplastics as distinctly different types of materials of dissimilar properties has also been recognized in patent prior art. For example, Effenberger, cited by the Examiner in the July 17, 2002 Office Action, teaches a fluoroplastic resin dispersion modified by the addition of a fluoroelastomer latex (Abstract; column 3, lines 9-18). The purpose of blending a rubbery fluoroelastomer with a fluoroplastic is to overcome the tendency towards cracking that is characteristic of the latter material (column 3, lines 23-29; TABLE A in columns 7-8). As previously noted in the Appeal Brief, Effenberger, at column 4, lines 6-47, names Viton® materials as examples of suitable fluoroelastomers. Not surprisingly, THV fluoropolymers are not included in this listing because they are not fluoroelastomers.

On page 4 of the July 17, 2002 Office Action, the Examiner stated that "It would have been obvious for one of ordinary skill in the art at the time the invention was made to have used as THV fluoroelastomers of a release layer of combination of Hartley et al. and Schlueter, Jr. et al. a commercially available series or family of thermoplastic '3M THV Fluoroplastics' comprising tetrafluoroethylene, hexafluoropropylene, and vinylidene fluoride comonomers combined in different ratios..."(emphasis added). This is just one of several examples in the Office Action of mischaracterization of THV fluoroplastics as fluoroelastomers. For example, in the citation of Effenberger on page 10 of the Office Action, the Examiner asserted that this reference teaches "the addition of a THV fluoroelastomer to PTFE or PEF (sic) for preventing cracking and enhancing flexibility." (emphasis added). In fact, there is no mention whatsoever of "THV" in Effenburger, which does, in fact, teach the blending of a rubbery fluoroelastomer (not THV) with a fluoroplastic to reduce cracking.

Schifman, cited by the Examiner in the September 19, 2002 Advisory Action, discloses, for use as a barrier layer, a blend of at least two fluorointerpolymers: a first fluorointerpolymer characterized as a fluoroelastomer, and a second fluorointerpolymer characterized as a fluoroplastic (column 1, lines 46-48; column 4, lines 33-37).

Schifman further discloses that the first fluorointerpolymer having elastomeric characteristics and the second fluorointerpolymer having thermoplastic characteristics each comprises a copolymer, terpolymer, or mixture thereof formed by the copolymerization of two or more monomers selected from the group consisting of HFP, VF, and TFE (column 1, line 57 to column 2, line 5). Thus, both the elastomeric

and the thermoplastic fluorointerpolymers taught by Schiffman are formed from the same group of three monomers that also constitute the fluorocarbon thermoplastic random copolymer included in the coating composition of the present invention.

Schifman, at column 4, lines 38-54, teaches that the blend used to form barrier layer 10 contains a fluoroelastomer that is a hexafluoropropylene-vinylidene fluoride copolymer, for example, a Viton® material available from DuPont, or a vinylidene fluoride-hexafluoropropylene-tetrafluoroethylene terpolymer, for example, a Fluorel® material available from 3M. The reference further teaches, at column 4, lines 54-57, that the fluoroplastic in the blend can be a tetrafluoroethylene-hexafluoropropylene-vinylidene fluoride terpolymer such as Dyneon THV, available from Dyneon. Thus, Schiffman discloses Viton® and Fluorel® copolymers and terpolymers as useful commercial fluoroelastomers and Dyneon THV as a suitable commercial fluoroplastic, and further teaches that terpolymeric fluoroelastomers and fluoroplastics can include the same three fluoromonomers.

Hartley, the primary reference cited in the rejection of the claims of the instant application, discloses a fuser roll having an outer layer that comprises a cured fluoroelastomer such as Viton® A or Viton® B, with pendant polydiorganosiloxane segments covalently bonded to its backbone. By contrast, the appellants' fuser roll release layer is formed from a coating composition containing a fluorocarbon thermoplastic random copolymer. In light of the foregoing discussion of the teachings of the prior art with respect to fluoroelastomeric and fluoroplastic polymers, the Examiner's position, as stated on page 5 and reiterated on page 15 of the Examiner's Answer, that these respective layers are identical or substantially identical in their structures and compositions and therefore presumably have the same inherent properties, is clearly not tenable. In regard to the Examiner's citation of Gilbert et al., US 2002/00011543 (sic), US 2002/0001543 (corrected), Abstract and paragraph [0007], as evidence that both Viton® and THV are fluoroelastomers, one would hope that the obvious error in the published application of characterizing THV as a fluoroelastomer is corrected in any corresponding issued patent.

High temperature curing of a fluoroelastomer release layer can cause damage to a fuser roll, for example, depolymerization of silicone rubber in the cushion layer. The instant specification teaches, at page 11, line 28 to page 12, line 3, the inclusion of antimony doped tin oxide particles as being crucial for drastically lowering the curing temperature range of the coated thermoplastic polymer, from 220-280°C, to the

substantially lower temperatures of 25°C-120°C, preferably 25°C to 50°C, more preferably 25°C. Hartley fails to teach the inclusion in the composition of antimony doped tin oxide, Schlueter being relied on to supply this missing disclosure. Hartley teaches curing temperatures of at least 230°C, with ramping up from 20°C to 230°C over a period of 12 to 24 hours. Schlueter cites no curing temperature, simply stating that the composition is subjected to a "step heat cure" for about 24 hours. Also, Example VI of Lentz, which discloses a fuser member containing two coated elastomer fuser layers, at least the outermost layer of which includes metal-containing filler particles, recites elastomer curing conditions of 232°C for 24 hours.

Column 6, lines 49-53 of Hartley, to which reference is made on page 5 of the Examiner's Answer, relates to the effect of the incorporated metal oxides on the toner release properties of the layer. As acknowledged on page 6 of the Examiner's Answer, the cited disclosures of Schlueter have to do with effects on the resistivity and conductivity of the release layer. The appellants agree with the Examiner's statement, also on page 6 of the Answer, that one of ordinary skill in the art would know that curing time depends on the materials included in a coating composition. However they disagree that the general conditions of the instant claims are known in the prior art, and they object to the improper citation of *In re Aller* here and on pages 11-12 and 14 in suggesting that the beneficially low temperature curing of the release layer of the present invention could have been determined by routine experimentation. None of the cited references teach or even suggest low temperature curing of a layer of fluoropolymer, either fluoroelastomeric or fluoroplastic, or of the use of a metal oxide or combination of oxides, in particular, zinc oxide and antimony-doped tin oxide particles, to achieve this beneficial result.

As already noted, the compositions disclosed in Blong, in contrast to those of Hartley, Lentz, Schlueter, and Eddy do include thermoplastic fluoropolymers. On page 11 of the Examiner's Answer, it is acknowledged that Blong teaches "a relatively new class of thermoplastic, chemically resistant, thermally stable, low permeable terpolymers of tetrafluoroethylene, hexafluoropropylene, and vinylidene fluoride comonomers combined in different ratios to get a range of different melting points (THV fluoropolymers) is commercially available and sold as a series of '3M THV Fluoroplastics' by the 3M Company. These fluoropolymers are more flexible and can be melt-processed at lower temperatures than most other fluoroplastics (See column 1, lines 34-45)." (emphasis by Examiner).

In the illustrative examples in Blong, 3M THV 500 Fluoroplastic is employed (column 6, lines 33-37). This same material, along with other THV fluoroplastics, is disclosed at page 12, line 25 to page 13, line 2 of the instant specification, as useful for inclusion in the coating compositions of the present invention, which can be cured at low temperatures. Blong, by contrast, does not teach the curing of the disclosed compositions but rather their melt-processing at temperatures of 180-280°C. This is not surprising, as fluoroplastics are commonly melt-processed by extrusion, with no included curing step. The Examiner's discussion of Blong on page 11, with its emphasis on melting points and lower temperatures, suggests a confusion of curing temperatures with melt extrusion temperatures.

The "Response to Arguments" section of the Examiner's Answer reiterates the Examiner's position that the fluoroelastomers employed in Hartley, Lentz, and Schlueter are not distinctly different from the fluorocarbon thermoplastic random copolymer included in the composition of the present invention, i.e., Viton® and THV materials are both fluoroelastomers, and therefore the coating composition of Hartley in view of Schlueter is substantially identical to the composition of the present invention as claimed. The appellants respectfully disagree with the Examiner's position.

As the foregoing discussion makes clear, fluoroelastomers and fluorocarbon thermoplastics are well recognized in the art as distinct types of materials, even if they are formed from the same monomers in amounts falling within the same specified ranges. In the process of the present invention, a composition that includes a fluorocarbon thermoplastic random copolymer, a curing agent, and antimony-doped tin oxide particles is cured at low temperatures, in the range of 25°C to 120°C. In contrast to the instant application, the disclosures of Hartley, Lentz, and Schlueter all teach compositions comprising fluoroelastomers, which typically are cured at elevated temperatures. Blong, like the instant application, does disclose compositions containing thermoplastic fluoropolymers, but these compositions are melt-processed at 180-280°C, not cured, and they contain no antimony-doped tin oxide particles. The teachings of these references are not combinable and, in any event, fail to render obvious the appellants' invention. Withdrawal of the §103(a) final rejections of claims 1-22 and allowance of this case is therefore again earnestly solicited.

Respectfully submitted,

April 29, 2003
Date

Lee J. Fleckenstein
Lee J. Fleckenstein
Registration No. 36,136

JAECKLE FLEISCHMANN & MUGEL, LLP
39 State Street
Rochester, New York 14614-1310
Telephone: (585) 262-0950
Facsimile: (585) 262-4133